

WHAT IS CLAIMED IS:

1. A method for reducing viscosity in an aqueous polysaccharide composition comprising combining the aqueous composition with a non-aqueous viscosity reducing agent and wherein the water content of the composition is at least about 40 wt%.
2. The method of claim 1, wherein the polysaccharide comprises a carbohydrate gum.
3. The method of claim 2, wherein the water content of the composition is at least about 50 wt%.
4. The method of claim 2, wherein the water content of the composition is at least about 80 wt %.
5. The method of claim 2, wherein the water content of the composition is at least about 85 wt%.
6. The method of claim 2, wherein the carbohydrate gum comprises at least one member selected from the group comprising agar, guar gum, xanthan gum, gum arabic, pectin, carboxymethyl cellulose, ethyl cellulose, methyl cellulose, hydroxypropylmethyl cellulose, hydroxypropyl cellulose and mixtures thereof.
7. The method of claim 6, wherein the carbohydrate gum comprises guar gum.
8. The method of claim 2, wherein the carbohydrate gum comprises oxidized carbohydrate gum.
9. The method of claim 8, wherein the oxidized carbohydrate gum comprises oxidized guar gum.
10. The method of claim 2, wherein the viscosity reducing agent comprises at least one member selected from the group comprising polyethylene glycols and mixtures thereof.
11. The method of claim 2, wherein the viscosity reducing agent comprises at least one polyethylene glycol.

12. The method of claim 11, wherein the at least one polyethylene glycol exhibits a molecular weight of from about 1,000 to about 50,000 daltons.

13. The method of claim 11, wherein the at least one polyethylene glycol exhibits a molecular weight of greater than about 1,000 daltons

14. The method of claim 2, wherein the viscosity of the aqueous composition is reduced by at least about 90% compared to the polysaccharide composition before combining the polysaccharide composition with the viscosity reducing agent.

15. The method of claim 2, wherein the viscosity of the aqueous composition is reduced by at least about 50% compared to the polysaccharide composition before combining the polysaccharide composition with the viscosity reducing agent.

16. The method of claim 2, wherein the viscosity of the aqueous composition is reduced by at least about 30% compared to the polysaccharide composition before combining the polysaccharide composition with the viscosity reducing agent.

17. The method of claim 2, wherein the viscosity of the aqueous composition is reduced by at least about 10% compared to the polysaccharide composition before combining the polysaccharide composition with the viscosity reducing agent.

18. A method for reducing viscosity of an aqueous composition of polysaccharide comprising combining viscosity reducing agent with the polysaccharide composition in an amount effective to form a two phase system comprising a continuous phase and a discontinuous phase.

19. The method of claim 18, wherein the polysaccharide comprises carbohydrate gum.

20. The method of claim 19, wherein the continuous phase is rich in viscosity reducing agent and the discontinuous phase is rich in polysaccharide.

21. The method of claim 19, wherein the viscosity of the aqueous composition is reduced by at least about 90% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

22. The method of claim 19, wherein the viscosity of the aqueous composition is reduced by at least about 50% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

23. The method of claim 19, wherein the viscosity of the aqueous composition is reduced by at least about 30% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

24. The method of claim 19, wherein the viscosity of the aqueous composition is reduced by at least about 10% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

25. The method of claim 19, wherein the polysaccharide is carbohydrate gum and the viscosity reducing agent comprises at least one polyethylene glycol.

26. The method of claim 25, wherein the at least one polyethylene glycol exhibits a molecular weight greater than about 1,000 daltons.

27. The method of claim 19, wherein the water content of the composition is at least about 40 wt%.

28. The method of claim 19, wherein the water content of the composition is at least about 50 wt%.

29. The meothd of claim 19, wherein the water content of the composition is at least about 80 wt %.

30. The method of claim 19, wherein the water content of the composition is at least about 85 wt%.

31. The method of claim 19, wherein the carbohydrate gum comprises at least one member selected from the group comprising agar, guar gum, xanthan gum, gum arabic, pectin, carboxymethyl cellulose, ethyl cellulose, methyl cellulose, hydroxypropylmethyl cellulose, hydroxypropyl cellulose and mixtures thereof.

32. The method of claim 31, wherein the carbohydrate gum comprises guar gum.

33. The method of claim 19, wherein the carbohydrate gum comprises oxidized carbohydrate gum.

34. The method of claim 33, wherein the oxidized carbohydrate gum comprises oxidized guar gum.

35. The method of claim 19, wherein the viscosity reducing agent comprises at least one member selected from the group comprising polyethylene glycols, and mixtures thereof.

36. The method of claim 35, wherein the viscosity reducing agent comprises at least one polyethylene glycol.

37. The method of claim 36, wherein the at least one polyethylene glycol exhibits a molecular weight of greater than about 1,000 daltons.

38. A method for reducing viscosity of an aqueous composition of polysaccharide comprising combining said aqueous composition with an effective amount of non-aqueous viscosity reducing agent such that the viscosity of the polysaccharide composition is reduced by at least about 10% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

39. The method of claim 38, wherein the polysaccharide comprises carbohydrate gum.

40. The method of claim 39, wherein the viscosity of the polysaccharide composition is reduced by at least about 30% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

41. The method of claim 39, wherein the viscosity of the aqueous composition is reduced by at least about 50% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

42. The method of claim 39, wherein the viscosity of the aqueous composition is reduced by at least about 90% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

43. The method of claim 39, wherein the water content of the composition is at least about 40 wt%

44. The method of claim 39, wherein the water content of the composition is at least about 50 wt%.

45. The method of claim 39, wherein the water content of the composition is at least about 80 wt %.

46. The method of claim 39, wherein the water content of the composition is at least about 85 wt%.

47. The method of claim 39, wherein the carbohydrate gum comprises at least one member selected from the group comprising agar, guar gum, xanthan gum, gum arabic, pectin, carboxymethyl cellulose, ethyl cellulose, methyl cellulose, hydroxypropylmethyl cellulose, hydroxypropyl cellulose and mixtures thereof.

48. The method of claim 47, wherein the carbohydrate gum comprises guar gum.

49. The method of claim 39, wherein the carbohydrate gum comprises oxidized carbohydrate gum.

50. The method of claim 49, wherein the oxidized carbohydrate gum comprises oxidized guar gum.

51. The method of claim 39, wherein the viscosity reducing agent comprises at least one member selected from the group comprising polyethylene glycols, and mixtures thereof.

52. The method of claim 39, wherein the viscosity reducing agent comprises at least one polyethylene glycol.

53. The method of claim 52, wherein the at least one polyethylene glycol exhibits a molecular weight of from about 1,000 to about 50,000 daltons.

54. The method of claim 52, wherein the at least one polyethylene glycol exhibits a molecular weight of greater than about 1,000 daltons.

55. ✓ An aqueous composition comprising polysaccharide and non-aqueous viscosity reducing agent, and wherein the water content of the composition is at least about 40 wt%.

56. The composition of claim 55, wherein the polysaccharide comprises carbohydrate gum.

57. The composition of claim 56, wherein the water content of the composition is at least about 50 wt%.

58. The composition of claim 56, wherein the water content of the composition is at least about 80 wt %.

59. The composition of claim 56, wherein the water content of the composition is at least about 85 wt%.

60. The composition of claim 56, wherein the carbohydrate gum comprises at least one member selected from the group comprising agar, guar gum, xanthan gum, gum arabic, pectin, carboxymethyl cellulose, ethyl cellulose, methyl cellulose, hydroxypropylmethyl cellulose, hydroxypropyl cellulose and mixtures thereof.

61. The composition of claim 60, wherein the carbohydrate gum comprises guar gum.

62. The composition of claim 61, wherein the carbohydrate gum comprises oxidized carbohydrate gum.

63. The composition of claim 62, wherein the oxidized carbohydrate gum comprises oxidized guar gum.

64. The composition of claim 56, wherein the viscosity reducing agent comprises at least one member selected from the group comprising polyethylene glycols, and mixtures thereof.

65. The composition of claim 56, wherein the viscosity reducing agent comprises at least one polyethylene glycol.

66. The composition of claim 65, wherein the at least one polyethylene glycol exhibits a molecular weight of from about 1,000 to about 50,000 daltons.

67. The composition of claim 65, wherein the at least one polyethylene glycol exhibits a molecular weight of greater than about 1,000 daltons

68. The composition of claim 65, further comprising a component capable of oxidizing carbohydrate gum.

69. The composition of claim 56, wherein the viscosity of the aqueous composition is reduced by at least about 90% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

70. The composition of claim 56, wherein the viscosity of the aqueous composition is reduced by at least about 50% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

71. The composition of claim 56, wherein the viscosity of the aqueous composition is reduced by at least about 30% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

72. The composition of claim 56, wherein the viscosity of the aqueous composition is reduced by at least about 10% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

73. ✓ A composition comprising polysaccharide, aqueous solvent and viscosity reducing agent, and wherein the aqueous polysaccharide composition is combined with an effective amount of viscosity reducing agent such that a two phase system comprising a continuous phase and a discontinuous phase is formed.

74. The composition of claim 73, wherein the polysaccharide comprises carbohydrate gum.

75. The composition of claim 74, wherein the continuous phase is rich in viscosity reducing agent and the discontinuous phase is rich in polysaccharide.

76. The composition of claim 74, wherein the viscosity of the aqueous composition is reduced by at least about 90% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

77. The composition of claim 74, wherein the viscosity of the aqueous composition is reduced by at least about 50% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

78. The composition of claim 74, wherein the viscosity of the aqueous composition is reduced by at least about 30% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

79. The composition of claim 74, wherein the viscosity of the aqueous composition is reduced by at least about 10% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

80. The composition of claim 74, wherein the polysaccharide is carbohydrate gum and the viscosity reducing agent comprises at least one polyethylene glycol.

81. The composition of claim 80 wherein the at least one polyethylene glycol exhibits a molecular weight greater than about 1,000 daltons.

82. The composition of claim 74, wherein the water content of the composition is at least about 40 wt%.

83. The composition of claim 74, wherein the water content of the composition is at least about 50 wt%.

84. The composition of claim 74, wherein the water content of the composition is at least about 80 wt %.

85. The composition of claim 74, wherein the water content of the composition is at least about 85 wt%.

86. The composition of claim 74, wherein the carbohydrate gum comprises at least one member selected from the group comprising agar, guar gum, xanthan gum, gum arabic, pectin, carboxymethyl cellulose, ethyl cellulose, methyl cellulose, hydroxypropylmethyl cellulose, hydroxypropyl cellulose and mixtures thereof.

87. The composition of claim 86, wherein the carbohydrate gum comprises guar gum.



88. The composition of claim 74, wherein the carbohydrate gum comprises oxidized carbohydrate gum.

89. The composition of claim 88, wherein the oxidized carbohydrate gum comprises oxidized guar gum.

90. The composition of claim 74, wherein the viscosity reducing agent comprises at least one member selected from the group comprising polyethylene glycols, and mixtures thereof.

91. The composition of claim 90, wherein the viscosity reducing agent comprises at least one polyethylene glycol.

92. The composition of claim 91, wherein the at least one polyethylene glycol exhibits a molecular weight of greater than about 1,000 daltons.

93. The composition of claim 91, wherein the at least one polyethylene glycol exhibits a molecular weight of from about 200 to about 8,000,000 daltons.

94. ✓ A composition for reducing viscosity of an aqueous composition of polysaccharide comprising combining an effective amount of non-aqueous viscosity reducing agent such that the viscosity of the polysaccharide composition is reduced by at least about 10% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

95. The composition of claim 94, wherein the polysaccharide comprises carbohydrate gum.

96. The composition of claim 95, wherein the viscosity of the aqueous composition is reduced by at least about 30% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

97. The composition of claim 95, wherein the viscosity of the aqueous composition is reduced by at least about 50% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

98. The composition of claim 95, wherein the viscosity of the aqueous composition is reduced by at least about 90% compared to the viscosity of the polysaccharide composition in the absence of the viscosity reducing agent.

99. The composition of claim 95, wherein the polysaccharide is carbohydrate gum and the viscosity reducing agent comprises at least one polyethylene glycol.

100. The composition of claim 95, wherein the at least one polyethylene glycol exhibits a molecular weight greater than about 1,000 daltons.

101. The composition of claim 95, wherein the at least one polyethylene glycol exhibits a molecular weight of from about 200 to about 8,000,000 daltons.

102. The composition of claim 95, wherein the water content of the composition is at least about 40 wt%.

103. The composition of claim 95, wherein the water content of the composition is at least about 50 wt%.

104. The composition of claim 95, wherein the water content of the composition is at least about 80 wt %.

105. The composition of claim 95, wherein the water content of the composition is at least about 85 wt%.

106. The composition of claim 95, wherein the carbohydrate gum comprises at least one member selected from the group comprising agar, guar gum, xanthan gum, gum arabic, pectin, carboxymethyl cellulose, ethyl cellulose, methyl cellulose, hydroxypropylmethyl cellulose, hydroxypropyl cellulose and mixtures thereof.

107. The composition of claim 106, wherein the carbohydrate gum comprises guar gum.

108. The composition of claim 107, wherein the carbohydrate gum comprises oxidized carbohydrate gum.

109. The composition of claim 108, wherein the oxidized carbohydrate gum comprises oxidized guar gum.

110. The composition of claim 109, wherein the viscosity reducing agent comprises at least one member selected from the group comprising polyethylene glycols, and mixtures thereof.

111. The composition of claim 110, wherein the viscosity reducing agent comprises at least one polyethylene glycol.

112. The composition of claim 111, wherein the at least one polyethylene glycol exhibits a molecular weight of greater than about 1,000 daltons.

113. A method of oxidizing carbohydrate gum comprising combining carbohydrate gum, aqueous solvent, non-aqueous viscosity reducing agent and an oxidizing component under conditions effective to oxidize the carbohydrate gum.

114. The method of claim 113, wherein the oxidizing component comprises a member selected from the group consisting of potassium dichromate, potassium permanganate, and mixtures thereof.

115. The method of claim 113, wherein the oxidizing component comprises a metal catalyst and hydrogen peroxide.

116. The method of claim 113, wherein the oxidizing component comprises galactose oxidase.

117. The method of claim 113, wherein the composition further comprises catalase.

118. A method of resolubilizing solid oxidized carbohydrate gum comprising combining aqueous solvent with the oxidized carbohydrate gum under conditions effective to give a resolubilized composition a pH less than about 7.

119. The method of 118, wherein the solid oxidized carbohydrate gum has a water content of less than 60%.

120. The method of claim 118, wherein the resolubilized composition has a pH less than about 6.

121. The method of claim 118, wherein the resolubilized composition has a pH less than about 5.

122. The method of claim 118, wherein the resolubilized composition has a pH of about 5.4.

123. The method of claim 118, wherein the resolubilized composition has a pH in the range of about 4 to about 7.

124. The method of claim 118, further comprising heating the combined solid oxidized carbohydrate gum and aqueous solvent.

125. The method of claim 124, wherein the resulting temperature of the resolubilized composition is 90°C.

126. The method of claim 124, wherein the resulting temperature of the resolubilized composition is greater than about 80°C.

127. The method of claim 124, wherein the resulting temperature of the resolubilized composition is within the range of about 65°C to about 115°C.

128. The method of claim 118, further comprising adding shear effective to create turbulence in the combined solid oxidized carbohydrate gum and aqueous solvent.

129. The method of claim 118, further comprising simultaneously adding shear and heating the combined solid oxidized carbohydrate gum and aqueous solvent.

130. The method of claim 129, wherein the resulting temperature of the resolubilized composition is 90°C and the pH is less than about 6.

131. The method of claim 118, wherein the aldehyde content of the resolubilized oxidized carbohydrate gum includes at least approximately 70% of the aldehyde content of the oxidized carbohydrate gum.

132. The method of claim 118, wherein the aldehyde content of the resolubilized oxidized carbohydrate gum includes at least approximately 80% of the aldehyde content of the oxidized carbohydrate gum.

133. The method of claim 118, wherein the aldehyde content of the resolubilized oxidized carbohydrate gum includes at least approximately 90% of the aldehyde content of the oxidized carbohydrate gum.

134. The method of claim 118, wherein the aldehyde content of the resolubilized oxidized carbohydrate gum is substantially the same as the aldehyde content of the oxidized carbohydrate gum.

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135. The method of claim 118, wherein the carbohydrate gum comprises oxidized guar.

136. The method of claim 118, wherein the resulting aqueous composition has a viscosity that is low enough for the composition to be pumpable.

137. The method of claim 118, wherein the concentration of oxidized guar in the resulting solution is less than 10 %w/v.

138. The method of claim 118, wherein the concentration of oxidized guar in the resulting solution is less than 5 % (w/v).

139. The method of claim 118, wherein the concentration of oxidized guar in the resulting solution is less than 1.5% (w/v).

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